Work Plan
Partial Excavation Alternative

Introduction

In an October 12, 2012 letter to the West Lake Landfill Operable Unit-1 (OU-1) Respondents ("EPA's Letter"), EPA directed Respondents to update the analysis of the alternative presented in the May 2006 Feasibility Study for OU-1 (EMSI, 2006) ("FS") involving excavation of material with higher levels of radioactivity ("FS Partial Excavation Alternative"). EPA's Letter requested that the updated analysis be at a level of detail comparable to the alternatives already analyzed in the Supplemental Feasibility Study (SFS) for West Lake Landfill Operable Unit-1 (EMSI, 2011). A Partial Excavation Alternative Work Plan was prepared and submitted to EPA in December 2012 (EMSI, 2012). It was proposed in the Work Plan that the same criteria used to define the volume of radiologically-impacted material (RIM) under the FS Partial Excavation Alternative be used to define the scope of the Partial Excavation with Off-Site Disposal Alternative and Partial Excavation with On-Site Disposal Alternative requested in EPA's Letter ("Partial Excavation Alternatives") -- that is, the presence of radionuclides with activity levels greater than 1,000 picocuries per gram (pCi/g) or the presence of downhole gamma readings greater than 500,000 counts per minute (cpm). At a September 24, 2013 follow-up meeting with the Respondents concerning Partial Excavation Alternatives, EPA requested instead that "back of the envelope" calculations be performed to estimate the volume of RIM that would be removed under three possible partial excavation scenarios. After considering the estimated volumes likely to require action under each of the three scenarios, EPA would direct the Respondents to conduct the analysis specified in the Work Plan using one of those three scenarios.

The three "back of the envelope" volume calculations EPA asked for were:

- The volume of soil within the areal extent of soil with combined radium-226 plus radium-228 or combined thorium-230 plus thorium-232 levels greater than 79 pCi/g (i.e., ten times 7.9 pCi/g, which is the sum of an unrestricted use limit of 5 pCi/g plus 2.9 pCi/g background) (the "79 pCi/g scenario");

- The volume of soil within the areal extent of soil with combined radium or combined thorium levels greater than 1,000 pCi/g, or with downhole gamma readings of 500,000 cpm or greater ("the 1,000 pCi/g scenario"); and

- The volume of soil within the areal extent of soil with combined radium or combined thorium levels greater than the 7.9 pCi/g unrestricted use criteria, but with excavation only from existing ground surface to a depth of 16 feet ("the 16-foot scenario").

While the Respondents have concerns regarding the scientific and regulatory bases for these criteria – most notably the combining of radium and thorium isotopes from different decay chains, the apparent lack of consideration of quantitative exposure risk, the application of the unrestricted use criteria at a landfill site that is subject to both land use and regulatory restrictions on future uses, and analyzing the

excavation of material at levels not dissimilar from material currently permitted for disposal in non-radiological landfills in certain states – the Respondents evaluated the soil volumes associated with each of these scenarios and submitted a report to EPA on October 31, 2014 (EMSI, 2014). EPA and MDNR provided comments on these evaluations and responses to these comments were provided on February 13, 2015.

Subsequently, in an April 20, 2015, letter to the Respondents, EPA directed that all three partial excavation options be developed into remedial alternatives and evaluated in detail in the Supplemental SFS report. Therefore, this work plan has been revised to include evaluation of the three partial excavation alternatives identified by EPA. EPA's April 20, 2015 letter also required the Respondents to perform additional characterization of Areas 1 and 2. Consequently, this work plan has also been revised to reflect inclusion of the results of the additional characterization into the evaluation of the three partial excavation alternatives identified by EPA.

Approach

Development of the three partial excavation alternatives will be performed in the same manner as was used to prepare the preliminary volume estimates for the three partial excavation options. Specifically, similar to the procedure described in Appendix B of the SFS, the results of the Additional Characterization of Areas 1 and 2, the Phase 1 Investigation (Feezor Engineering, 2014), the Phase 1D investigation, the RI (EMSI, 2000) and pre-RI (RMC, 1982 and NRC, 1988) data will be reviewed to identify those soil borings and depth intervals that contain combined radium or combined thorium greater than 79 pCi/g ("the 79 pCi/g scenario") and 1,000 pCi/g ("the 1,000 pCi/g scenario"). The downhole gamma logs will also be reviewed and evaluated to identify locations and depth intervals with downhole gamma readings of 60,000 cpm or greater ("the 79 pCi/g scenario") and those with downhole gamma readings of 500,000 cpm or greater ("the 1,000 pCi/g scenario"). The results of these evaluations will be tabulated to identify the locations and depth intervals that contain, or are likely to contain, radionuclide occurrences in soil and refuse above the 79 pCi/g / 60,000 cpm and the 1,000 pCi/g / 500,000 cpm levels.

The 16-foot partial excavation scenario would involve excavating any RIM containing radium, thorium or uranium at levels greater than the criteria that would allow for unrestricted use (*i.e.*, total radium greater than 5 pCi/g plus background, total thorium greater than 5 pCi/g plus background, or total uranium greater than 50 pCi/g plus background) that lies within 16 feet of the existing ground surface - even though the landfill is not anticipated to be released for unrestricted use. Determination of the volume of RIM that would be included under this partial excavation alternative will first require completion of the additional evaluation of the "complete rad removal" alternatives followed by definition of the extent, configuration and volume of this material that is located within 16 feet of the ground surface.

The detailed evaluation of the Partial Excavation Alternatives will be prepared in a similar manner and level of detail as was used for the evaluation of the ROD-selected remedy and the two "complete rad removal alternatives," as presented in the SFS. Specifically, excavation and final grading plans will be

prepared for the Partial Excavation Alternatives based on the criteria listed above. The volumes of overburden and RIM that would be excavated under these alternatives will be calculated based on the results of the Additional Characterization of Areas 1 and 2 and the results of all prior investigations, including the Phase 1 and Phase 1D investigations of Area 1 and the earlier RI and NRC investigations of Areas 1 and 2. The thickness of cover material necessary to provide protection against gamma radiation and radon emissions from any RIM that would remain onsite under the Partial Excavation Alternatives will be calculated using the same approach as was used in the SFS for evaluation of the cover thickness for the ROD-selected remedy. Construction schedules and cost estimates will be developed for the Partial Excavation Alternatives at similar levels of detail and based on similar assumptions and factors as were used to develop the schedules and cost estimates presented in the SFS. Calculations of the residual long-term risks that may remain under the Partial Excavation Alternatives, as well as calculations of potential short-term risks to workers and the public, will be performed in a manner similar to that used in the SFS.

Deliverables

Preliminary deliverable – A technical memorandum will be prepared that presents the extent, configuration and volume of RIM associated with each of the three partial excavation alternatives identified by EPA. The extent, configuration and volume of RIM associated with each of the alternatives will be based on evaluation of the results of the prior (NRC, RI, FS, and SFS) evaluations combined with the results of the three more recent/currently ongoing/near future investigations (i.e., the Phase 1 and Phase 1D investigations of Area 1, and the Additional Characterization of Areas 1 and 2).

Interim Deliverable –A technical memorandum will be prepared that presents the following information relative to the Partial Excavation Alternatives:

1. Definition of and basis for the overall scope of the Partial Excavation Alternatives;
2. Excavation and final grading plans;
3. Cover thickness calculations;
4. Short-term and long-term risk calculations;
5. Construction schedules (for both fiscally and non-fiscally constrained approaches);
6. Construction cost estimates (for both fiscally and non-fiscally constrained approaches); and
7. Present value analysis (for both fiscally and non-fiscally constrained approaches).

SFS Revisions – The existing SFS text, tables and appendices will be amended to include the results of the Partial Excavation Alternatives development and evaluation. Subject to EPA comments on the Interim Deliverable, the following specific revisions to the December 2011 SFS report are anticipated:

1. New SFS Sections would include:
    a. Section 5.4 describing the Partial Excavation Alternatives
    b. Section 6.2.4 presenting the detailed evaluation of the Partial Excavation Alternatives with Off-Site Disposal
    c. Section 6.2.5 presenting the detailed evaluation of the Partial Excavation Alternative with On-Site Disposals

d. New Appendix or New Sub-Appendices to Appendix B to present the evaluation of the volumes of RIM to be excavated under the Partial Excavation Alternatives

2. Sections of the SFS that would need to be amended include:
    a. Section 7 – Comparative Analysis
    b. Appendix F – Calculate the required cover thickness associated with the Partial Excavation Alternatives
    c. Appendix H – Estimate the potential risks to the community and workers based on the volumes of RIM and overburden material to be excavated and revised construction schedules under the Partial Excavation Alternatives
    d. Appendix I – Prepare additional estimates of Greenhouse Gas Emissions associated with the Partial Excavation Alternatives
    e. Appendix J – Prepare additional construction schedules for the Partial Excavation Alternatives
    f. Appendix J – Prepare additional estimates of the construction costs (both fiscally constrained and not-fiscally constrained) for the Partial Excavation Alternatives

Clarifications by EPA

Respondents request that EPA clarify whether the development and evaluation of the partial excavation alternatives should include both on-site and off-site disposal alternatives similar to the "complete rad removal" alternatives.

Schedule

Evaluation of the partial excavation alternatives cannot be performed until all of the results of the Additional Characterization of Areas 1 and 2 have been obtained, tabulated, plotted, reviewed and reported. EPA previously indicated that it will require the Respondents to prepare a Comprehensive Report of the results of the previous NRC and RI investigations, the Phase 1 and Phase 1D Investigations, and the Additional Characterization of Areas 1 and 2. Therefore, preparation of an evaluation of the Partial Excavation Alternatives is dependent upon completion of the Comprehensive Report. It is estimated that once the Comprehensive Report has been prepared, it will take three months to prepare volume estimates for the three partial excavation alternatives. It should be noted that in order to prepare a volume estimate for the 16-foot depth alternative, we will first have to prepare a revised estimate of the extent and configuration of RIM associated with the "complete rad removal" alternative and then determine the extent, configuration and volume of RIM located in the uppermost 16 feet of the overall extent of RIM-containing radionuclides at levels above the criteria identified by EPA for the "complete rad removal" alternative.

It was originally anticipated that evaluation of the Partial Excavation Alternatives and preparation of an Interim Technical Memorandum would require approximately four months after EPA approval of this Work Plan. However, that estimate was based on the assumption that only one partial excavation alternative would be evaluated, not three alternatives. It is estimated that it will take approximately nine (9) months after release of the Comprehensive Report to develop excavation and grading plans,

finalize estimates of the extent, configuration and volume of RIM and overburden material, perform calculations regarding the required landfill cover thickness and potential short-term and long-term risks, and prepare construction schedules and cost estimates for the three partial excavation alternatives.

However, in addition to evaluation of the three partial excavation alternatives, once the Comprehensive Report is prepared, revisions to the extent, configuration and volume of RIM associated with the two "Complete Rad Removal" alternatives and preparation of an Alternative Area 2 RIM Volume will also need to be performed. Preparation of estimates of the extent, configuration and volumes of RIM associated with these alternatives will require many of the same resources such that although any one of them may be completed within a three month time frame, evaluation of all of them cannot be completed within such a time frame.

The Respondents recommend that the initial efforts should be directed toward preparation of revised estimates of the extent, configuration and volume of RIM associated with the two "Complete Rad Removal" alternatives based on the results presented in the Comprehensive Report first, followed by preparation of volume estimates for the three partial excavation alternatives and lastly preparation of the volume estimate for the revised Area 2 volume (if necessary). However, the Respondents will seek direction from EPA as to prioritization of the order in which revised estimates of the extent, configuration and volumes of RIM for each of the alternatives should be prepared.

Preparation of a Supplemental SFS report that includes the results of the evaluations of the Partial Excavation Alternatives will be performed once EPA comments on the interim deliverable are received, and in conjunction with revisions to the existing SFS report required to address the results of the various other additional tasks EPA has requested.

References

Engineering Management Support, Inc. (EMSI), 2015a, Responses to EPA (D. Kappleman) Comments on Preliminary Volume Estimates for EPA's Partial Excavation Options, West Lake Landfill OU-1, February 13.

EMSI, 2015b, Responses to Comments Provided by MDNR in its January 29, 2015 letter, February 13.

EMSI, 2014, Estimated Volumes for Partial Excavation Options Identified by EPA, West Lake Landfill Operable Unit-1, October 31.

EMSI, 2012, Draft Work Plan - Partial Excavation Alternative, West Lake Landfill Operable Unit-1, December 4.

EMSI, 2011, Supplemental Feasibility Study, Radiologically-Impacted Material Excavation Alternative Analysis, West Lake Landfill Operable Unit-1, December 16.

EMSI, 2006, Feasibility Study, West Lake Landfill Operable Unit-1, May 8.

EMSI, 2000, Remedial Investigation Report, West Lake Landfill Operable Unit 1, April 10.

Radiation Management Corporation (RMC), 1982, Radiological Survey of the West Lake Landfill, St. Louis County, Missouri, NUREG/CR-2722, May.

Nuclear Regulatory Commission (NRC), 1988, Radioactive Material in the West Lake Landfill – Summary Report, NUREG 1308 – Rev. 1, June.

U.S. Environmental Protection Agency, 2015, Letter from Alyse Stoy (EPA) to William Beck et al., (OU-1 Respondents) RE: In the Matter of Cotter Corporation (NSL), and Laidlaw Waste Systems (Bridgeton), Inc., and Rock Road Industries, Inc., and the U.S. Department of Energy Administrative Order on Consent, EPA Docket No. VII-93-F-0005, April 20.